TEXTILE RESEARCH

Publication of

United States Institute for Textile Research, Inc.

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Publication Office: Prince and Lemon Sts., Lancaster, Pa.

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Vol. VI **September, 1936** **No. 11**

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Entered as second-class matter, November 17, 1932, at the Post Office at Lancaster, Pa., under the Act of Congress of March 3, 1879.

Issued monthly at Prince and Lemon Streets, Lancaster, Pa., for United States Institute for Textile Research, Inc., Boston, Mass..
Made in United States of America.

Subscription price $5.00 a year. Single copies .50

The Editor's Page

UNDER the "Revenue Act of 1936" anticipated earnings of a corporation which are expended for research and developmental work on its products, on sales promotion, advertising, or other controllable expenses which by established tax practice need not be capitalized, are subject to neither the normal tax nor surtax, according to reliable advices. To corporations with large potential profits which should utilize their current earnings in this manner the government would, in effect, give a 32% subsidy. It is to be hoped that textile earnings will be sufficient to encourage manufacturers to divert a substantial proportion to these constructive purposes, instead of distributing all of them in dividends to avoid the heavy penalty surtax.

* * *

BECAUSE "Lanital," the so-called artificial wool developed in Italy from a casein base, fails to duplicate many of the chemical and physical properties of natural wool, there has been a very general tendency to disparage its commercial possibilities. Much greater optimism as to its practical fabric value when properly mixed with wool is expressed in a communication published in this issue by H. C. Borghetty, chief chemist of the Aspinook Company. He also calls attention to the only chemical method of detecting the presence of "Lanital" in mixed wool fabrics.

* * *

AT the dedication last spring of the new extensions to the Shirley Institute of the British Cotton Industry Research Association it was emphasized by members of the Advisory Council of the Government Department of Scientific and Industrial Research that, while these extensions are specifically designed for the Institute's increasing service work for the industry, fundamental research must not be overlooked. It was also held that "research institutions should be run by industry for industry." However, it was made public that the D. S. I. R. was prepared to contribute another £20,000 up to 1939, or £40,000 altogether, provided the industry showed its interest by contributing a similar sum.

* * *

SHIRLEY Institute is the largest textile research laboratory in the world. According to data published in the *Journal of the Society of Dyers and Colorists* "it covers an area of about three acres, provides a floor space of nearly 100,000 sq. ft., and has a staff of about 250, including 85 graduates. Since 1919, it has spent nearly £1,000,000 upon research work, mainly in connection with the cotton industry, although its work also includes problems associated with rayon and silk. The annual expenditure is £82,000."

* * *

Textile Distribution Study

THE study of "Production and Distribution Organization in the Textile Industry," which is financed by the Textile Foundation and is being conducted under the advisory supervision of the Committee on

Economic Research of U. S. Institute for Textile Research by the Wharton School, University of Pennsylvania, has received the endorsement of most of the leading associations of the industry. The following association executives joined with U. S. Institute in recommending the study and approving the selection of the Wharton School to conduct it, and will act with U. S. Institute's committee in an advisory capacity: W. Ray Bell, president, Association of Cotton Textile Merchants of New York; Arthur Besse, president, National Association of Wool Manufacturers; A. W. McCready, representing National Federation of Textiles, Inc.; Dr. C. T. Murchison, president, Cotton-Textile Institute.

Among other executives of leading textile associations who have expressed willingness to co-operate are the following: A. F. Allison, secretary of the International Association of Garment Manufacturers; Roy A. Cheney, managing director of the Underwear Institute; Earl Constantine, managing director of the National Association of Hosiery Manufacturers; Chas. Whitney Dall, president of the National Rayon Weavers Association; W. P. Fickett, president of the Textile Fabrics Association; Carl S. Whittier, executive secretary, Woven Elastic Institute.

Joseph H. Willits, dean of the Wharton School, will be in general charge of the study and will be assisted by the following members of the Industrial Research Department: C. Camby Balderston, professor of industrial management; Anne Bezanson, co-director of the department; H. S. Davis, in charge of the wool section; and George W. Taylor, in charge of the hosiery section. Mr. Davis will serve as secretary of the group. Other members of the department and of the school will be called upon to participate in particular phases of the study.

* * *

"Lanital"-Wool Mixed Fabrics

Editor, TEXTILE RESEARCH:

"Several issues of TEXTILE RESEARCH have contained preliminary articles concerning the new casein fibre, 'Lanital,' but actual information regarding its working qualities in fabric form has not been made available. Because samples of its fabrics were not obtainable on the American market the only investigations made so far were carried out on the product in fibre form.

"Through connections abroad I have obtained several samples of this product in yarn, fabric and loose form and I have been able to make several tests which supplement the meagre information thus far available. I am enclosing a small sample of a fabric which is composed of 50% 'Lanital,' 50% wool, and also a sample of the pure 'Lanital' fibre.

"May I say that the investigators of this fibre so far have been concerned merely with comparing it to wool, and they all seem to rush to the premature conclusion that, as it is not an exact duplicate of wool, then it has no field of application. There is no doubt whatever that the new fibre does not reach the perfection of wool and, therefore, it is rather disappointing to any investigator who compares the two fibres directly. Casein wool, however, will probably have a field of application in fabrics in which it is incorporated with wool up to about 50–60%.

"The new fibre resembles wool in its chemical constitution and comports itself as wool during dyeing, excepting that it has a much greater

affinity for the dyestuffs. In its physical aspects, particularly when viewed under the microscope, it shows no wool characteristics whatever and resembles rayon. It burns like wool and behaves similarly to wool when treated with alkali, excepting that it swells quickly in the presence of even weak alkaline solutions and takes on a pulpy appearance. This susceptibility can be greatly alleviated by adding formaldehyde to the solution. Its outstanding behaviour is that it has no felting qualities whatever, but when mixed with wool it is capable of greatly facilitating the felting action of the wool. Rayons and cottons, instead, hinder the felting properties of wool. Should wool fabrics appear on the market containing large percentages (up to 50%) of 'Lanital' it will be very difficult and puzzling to distinguish the amounts of the two fibres, because the resultant fabrics behave like wool. The only means of detection thus far is to utilize its greater resistance than wool to a boiling caustic bath in the presence of formaldehyde.

"The aim of this letter is to emphasize the possibility of this fibre becoming popular as a new fibre, or as a substitute for a portion of the wool in woolen and worsted fabrics."

Signed: H. C. Borghetty, Chief Chemist,
The Aspinook Company, Jewett City, Conn.

* * *

Textile Research in Japan

JAPANESE scientists have made valuable contributions to the world's basic knowledge of textile fibres, particularly silk. Until recently, however, Japan has had no research organization devoted solely to textiles. In September of last year the Sen-i Kwagaku Kenkiusho (Textile Research Institute of Japan) was incorporated to conduct fundamental research work, chemical and physical, on textile fibres, with laboratories located at the Imperial University of Osaka. The president of that university, Chosaburo Kusumoto, M.D., is named as the founder, but Dr. Gompei Kuwada, president of the Nihon Spindle Co. of Osaka, and a director of the new institute, took an active part in its organization; he is a graduate of Worcester (Mass.) Polytechnic Institute. The physical department of the institute will be headed by Dr. H. Yagi, professor of applied science at Osaka University, and the chemistry department by Dr. M. Go, a graduate of Geneva University and formerly professor of chemistry at Berne University. The Board of Directors, in addition to Dr. Kusumoto, Dr. Kuwada, Dr. Yagi and Dr. Go, has the following members: O. Shoji, president Toyo Spinning Co. and Boseki Rengokwai (Association of Cotton Industries of Japan); I. Iio, president Godo Spinning Co.; R. Nagao, director Kawasaki Dodsyard Co., and K. Imamura, managing director, Dainihon Spinning Co.

A government appropriation provided funds for the laboratory building, but for equipment not furnished by Osaka University and for operating and other expenses funds must be raised by the directors. The directors have before them the same problem of securing financial support from the industry that is faced by research organizations in this country. Reports of completed work will be made available to members each month, and annually a year book will be published covering textile research throughout the world as well as that of this institute; it is planned to reprint this year book in English, German or French.

Continued on page 490

Wool Top Standards

By ERWIN O. KRUEGEL *

General

WOOL and wool top standardization has been a topic of discussion for a good many years. The urgent need for some well defined wool standard was realized as early as 1914 when the National Association of Wool Growers made a request of the Government in the form of a resolution which read as follows:

"Wheras at the present time there are no definite standards for the determination of the several wool grades.

"Therefore, be it resolved, that this association recommend that the Department of Agriculture create a standardization for wool the same as it has done with cotton, and, if possible, establish a set of definite standards by which the different grades of American wool may be distinguished."

Work was begun by the Department of Agriculture to classify the many samples submitted to the Department by dealers and manufacturers. By elimination of duplicate samples the number of samples representing the range of diameter from the finest to the coarest was reduced to 26 groups. A further classification reduced the 26 into seven sections of approximately equal range. After it had been found that the proposed grades were feasible and practical, these standard grades were established by the Secretary of Agriculture as the official wool standards of the United States for grade and became effective for permissive use July 1, 1923. The seven grades set up are as follows:

Fine	¼ Blood
½ Blood	Low ¼ Blood
⅜ Blood	Common

Braid

At conferences held prior to the acceptance of the wool grades, reference was made to the fact that the United States is dependent upon foreign countries (especially Great Britain and her Dominions) for much of her wool. Thus it was suggested that the nomenclature already in use in England should not be ignored. Also the fact was brought out that manufacturers require a greater number of divisions in the wool grade scale than did the grower.

Thus, in 1925, the United States wool standardization committee visited England for the purpose of correlating the American and English practice. The English committee suggested at that time the establishment of a set of wool top standards of the same fibre diameter as the

* Mr. Kruegel is a Textile Foundation Fellow working under the direction of Prof. E. R. Schwarz at the Massachusetts Institute of Technology, Cambridge, Mass.

grades of wool. This proposal met with the approval of the American committee.

As a result an invitation was extended to the wool combing establishments in the Bradford district to submit samples representing the various grades used in their own plants. These samples were then classified into 12 numerical grades according to fibre diameter. After these negotiations were complete two sets of the new standards were brought to the United States and were adopted as the official wool top standards.

Sources of Wool Supply for Top Making

Although the official wool top standards were accepted by manufacturers' associations they have never fulfilled the position intended for them in the trade. In recent years they have come to be looked upon as a definitely liability rather than an asset. This is so because the present standards are representative of foreign practice and cannot be called upon to serve as a means of grading our domestic wool top. The statement that the United States was dependent upon foreign countries for much of her wool was true 15 years ago. Since then, however, the sources of American wool supply, as well as manufacturing methods, have changed. The United States, within the last few years, has become almost self-sufficient in wool procurement. Tables I and II show a comparison of

Table I

WOOL, Imported, Production, Retained for Consumption

Fiscal Year	Net Imports Classes I and II Clothing and Combing*	Estimated Wool Production	Retained for Consumption
1933-34	38,000	418,000	456,200
1932-33	6,400	428,900	435,300
1931-32	20,600	435,400	456,000
1930-31	45,100	413,400	458,500
1929-30	77,900	363,400	441,300
Average	37,500	415,460	452,960

* Includes foreign mohair. Source, Bureau of the Census. Hundreds (,000) omitted.

the wools suitable for the woolen and worsted industry, Table I covering the five-year period from 1929–34, and Table II that from 1919–24. The net imports of foreign wools in Class I and II, combing and clothing, has decreased from an annual average of 230 millions of pounds during 1919–24 to 38 millions of pounds during 1929–34. Our own annual average estimated production has increased from 283 millions of pounds to 415 millions of pounds.

Carpet wools, of which the United States consumes approximately 130 millions of pounds annually, were excluded because they are not and probably cannot be produced to advantage in this country.

Table II

WOOL, Imported, Production, Retained for Consumption			
Fiscal Year	Net Imports Classes I and II Clothing and Combing*	Estimated Wool Production	Retained for Consumption
1923-24	88,100	266,100	354,200
1922-23	346,700	261,100	507,800
1921-22	103,600	273,100	376,700
1920-21	263,100	302,200	565,300
1919-20	342,400	314,200	656,600
Average	229,400	283,340	512,740

* Includes foreign mohair. Source, Bureau of the Census. Hundreds (,000) omitted.

Of the total supply of foreign and domestic wool retained for consumption only the combing class is suitable for the manufacture of top. In Table III is shown a comparison of the consumption during 1929–33 of the domestic and foreign wools of the combing class, as reported by grade.

Table III

U. S. Wool Consumption, in Condition, as Reported by Grade (millions of pounds)					
Grades	1933	1932	1931	1930	1929
Fine 64s, 70s, 80s					
Domestic Combing	140.9	105.5	128.6	103.8	108.7
Foreign Combing	6.3	5.0	14.7	17.8	13.5
1/2 Bld. 58s, 60s					
Domestic Combing	51.7	43.5	54.1	35.7	40.5
Foreign Combing	1.8	2.2	5.5	8.4	10.2
3/8 Bld. 56s					
Domestic Combing	41.8	30.8	43.5	21.2	33.3
Foreign Combing	1.4	1.3	3.8	7.7	11.9
1/4 Bld. 48s, 50s					
Domestic Combing	34.3	33.5	35.1	22.0	30.8
Foreign Combing	2.6	1.3	2.6	7.2	11.6
Low 1/4 Bld. 36s, 40s 44s, 46s.					
Domestic Combing	7.8	6.3	8.4	4.3	6.3
Foreign Combing	6.4	2.8	6.7	11.6	18.4

The worsted industry for which the top standards are especially useful uses American wools almost exclusively. Over a five-year average less than 10% of all the fine combing wools used was foreign. In the grades ½-Blood to ¼-Blood between 10 and 14% was foreign. The only

grade class in which foreign wools competed with our domestics was that of low ¼-Blood (46s–36s). In this class the American manufacturer has been forced to avail himself of foreign wools because of their vast superiority over our own and also because of the limited supply available in this country. At the present time a large part of the wools in this class come from South America, *i.e.* B. A's or Montivedios, 4s, 5s and 6s.

As the majority of the wools used for the manufacture of top are American wools, manufactured by American industry in accordance with accepted good practice, the official standards must be representative of American practice and American wools to receive the recognition and use they deserve. This must not be interpreted to mean that the grade nomenclature now in use should be changed or that the standards be lowered. It merely means that the standard should be defined so as to be a workable unit for the trade.

Objection to Present Standards

As wool top is not a highly perishable commodity it lends itself rather readily to standardization. But it must be remembered that wool top is a commodity and as such is subject to the laws of nature, supply and demand, and to those of manufacture. Any attempt to define wool top as a concrete unit cannot and will not be acceptable to the trade.

Perhaps the greatest objection to the present standards for wool top is the lack of some specification as to diameter and fineness tolerance. Due to a higher cost of labor and increased competition the wool textile industry has been forced to adopt mass production methods wherever possible in order to compete successfully in both domestic and foreign markets. The one step taken towards this end that has a direct effect on wool top is that of trapping or bulk sorting. Now this procedure introduces characteristics into a top that cannot be evaluated by comparison with tops from carefully sorted fleeces such as the official standards. Also this procedure has made it necessary, more than ever before, that the top standards be definite as to what units of fineness constitute a quality. There are some who have carried trapping to such an extent that the resultant top cannot be justly called the quality designated by the manufacturer. Yet, due to the lack of specification, there is always the question as to whether or not it compares with the corresponding standard.

Thus it is to be recommended that the official standards be amended with grade tolerances as determined by good practice in converting American wools into top. This idea, although a little new in the textile field, had been accepted by other industries many years ago. It would be impossible for such industries as the steel and automotive to manufacture without some tolerance on their product. Likewise it is impossible for the top industry to prepare top for delivery against a Government standard without some conception, other than simple human opinion, as to the tolerance allowable. In the past, controversy has been caused by two things:

(*a*)—Differences in opinion on fineness.
(*b*)—Differences in opinion pertaining to other characteristics, such as staple, handle, color, etc.

Of these two factors, differences in opinion on fineness far outnumber those on other characteristics. Thus the question now arises as to how definite

tolerance limits can be applied to wool top and in what manner they can be evaluated.

Wool research organizations have worked for many years in an effort to correlate the important attributes of wool top as fineness, staple and strength with quality valuations of wool top as determined by the wool top expert. The major difficulty has been, not the lack of correlation, but rather the laborious and exacting methods required for such correlation. This factor has, to a very large extent, prevented earlier application in the industry.

Desirability of New Top Standards

Since 1928 several practical methods for determining fineness and staple of wool top have been put forth and have, in turn, been adopted by a relatively large number of manufacturers. As a result a survey of the larger top making establishments and worsted manufacturers for their opinion on the proper methods of defining the top standards was made by the author. Some have suggested that the top should be classified for spin as well as for fineness, stating that spin would take into account many factors that cannot be determined by any direct method of measurement. Others are of the opinion that both fineness and staple should be included in order to make the standards more complete.

Any attempt to define the standards in terms of spin would have a very serious effect on the value of the standards. The question arises as to how this value of spin could be determined. Should the top maker guarantee that a top will spin to certain counts and should the checking of this guarantee be left to the spinner? It requires but little thought to realize that such a system would lead to no end of trouble. Spin is a factor that depends largely on the personnel and equipment of each individual mill. One mill will spin a top to a higher count than another because of better skill in the art, with no reflection on the quality of the top.

A staple specification, although desirable, would be something of a handicap if applied to a standard that is to serve the industry as a whole. Top makers and manufacturers require a certain degree of freedom in each quality for staple so as to meet the particular requirements of their customers. Second, stable length of wool is dependent to a large extent on the environment and feeding conditions for the sheep. It is well known that under favorable conditions wools will, on the average, be longer than in unfavorable years. Nevertheless the grade for the various staple lengths required for manufacturing, as well as the grade of wool in favorable and unfavorable years, will be substantially the same. For this reason it would be necessary to subdivide each grade into several length classes with specifications for each. Such a system has been adopted and used by the Wool Top Exchange in placing a valuation on a top. Each grade panel is divided into several sections above and below a "par" top. For example, the C, or 64s, panel is designated as follows: C_1, C_2, "par," or C_3, and C_4. In this system the "par," or C_3, top is the standard for the grade and staple while C_2 and C_1 are of the same grade but have a longer staple; C_4 is of the same grade but is shorter in length, usually of the French combing type. The valuations, of course, increase as the staple increases. Since the primary object of the system used by the Exchange is to evaluate the percentage appreciation or depreciation of a top from the standard, *i.e.*, the par or C_3 top, this gradation in staple length is both desirable and feasible.

The Official Standards never have been nor, to all intent and purpose, ever will be used for the purpose of placing a monetary value on top. There seems to be no reason, then, why staple should be included. Again, resultant staple diagrams can be changed sufficiently by the age of the top that the tolerances necessary to take care of these variations would be so great as to lose the advantages of the diagram.

The only measurable attribute of wool quality that can be an asset to the standards are those of diameter and fibre distribution. Specification of these well-known characteristics should be attempted only after considerable study of trade practice. It would be unwise to take the results of a few tests and from them attempt to set up tolerances of diameter and fineness distribution that would stand the tests of commercial practice.

In the proposed amendments to the top standards the need for a definite specification for diameter and fineness distribution is obvious; but it is also vital that these specifications be of such a nature as not to cause a greater dilemma than the one that now exists. There has always been the danger of scientists carrying the application of a method to such a degree that the advantages are completely lost, because of failure to appreciate the practical problem, and this is especially true in methods for grading textile materials.

It is conceded by the wool trade in general that some microscopic measurement may be the desirable basis for fineness determinations. However, it is necessary that a thorough investigation be made of the merits and feasibility of any such method before it be adopted as official.

Variables in Microscopic Measurements of Top

First, it must be definitely understood that any series of measurements will not agree exactly. The cause of these discrepancies lies in the various sources of error to which all data are subject. Thus, in May 1935, comparison specifications [1] for top quality determinations were advanced. These specifications were necessary because of the many controversies that had come up as to the interpretation of top quality measurements by the so-called "wedge method." [2]

Since then progressive organizations as the American Society for Testing Materials have attempted to set up specifications as to method of sampling, measurement, and calculation of wool top fineness.[3] These specifications were designated as tentative, and in order to check their feasibility an "inter-laboratory" test [4] was conducted. The results of this test are given in Table IV.

Each laboratory making a fineness determination on the submitted sample was given a free hand as to sampling and measurement. As a result, the average fibre diameter varied from a low value of 29.4 microns to a high of 32.2, the number of fibres measured from 200 to 2000, and the standard deviation from 6.8 to 8.0. All of these tests were made on exactly the same top, *i.e.*, U. S. Government Standard 50s quality.

Before discussing the sources of error in top quality determinations that may influence the average values obtained in this inter-laboratory test it might be well briefly to review precision of measurement in general.

All physical measurements may be classed as direct or indirect, depending on whether the measurements give the result directly or whether the result is obtained by combining the results of several measurements by

Table IV

Mill Laboratory	Number of Fibers	Arith. Mean Width Microns	Standard Deviation Microns
A	400	29.8	7.4
B	1000	30.7	7.5
C	5000	32.2	8.0
D	400	31.0	7.0
E	2000	31.4	7.1
F	200	31.4	7.0
G	400	31.0	6.9
H	----	31.1	7.1
I	200	30.2	7.8
J	400	29.4	7.5

means of some formula. Wool fineness determinations obviously deal with the first class.

Now in order that the result of any measurement, whether direct or indirect, may be of any scientific value, it is necessary to have some numerical estimate of its reliability. This numerical estimate is expressed by means of the standard deviation and standard error in top fineness measurements. By the precision, or precision measure, of a result will always be understood the best numerical measure of its reliability that can be obtained after all known sources of error have been eliminated or corrected for.

The various sources of error to which all data are subject may conveniently be grouped into two classes: determinate and indeterminate. Determinate errors are, as their name implies, of such a nature that their value can be found and their effect on the result therby corrected. In wool fineness measurements direct errors may be classified as instrumental, sampling, and personal errors.

An instrumental error which, uncorrected, leads to variations in results is that caused by spherical aberation (distortion at the edges) in the lens system. Measurement has shown that at 250 diameters this error amounts to 3 or 4% from the center to the edge of the field. To determine the effect of this error on fibre measurement 50 fibres were measured across the projected field, and within a two-inch square at the center of the projected field. To check personal differences the same fibres were measured again by both methods. The results are given in the following Table V:

TABLE V

Sample	Across Field	Within Two Inch Square
A	38.9	37.9
B	38.8	37.9
Aver.	38.85	37.9

It is interesting to note that in both cases the average value for each 50 fibres is nearly the same. A difference of approximately one mi-

cron exists between the measurements made in one way and those made in another.

Turning again for the moment to the tests in Table IV, it is reasonable to believe that some of the differences in the average values are due to the variation in fibre measurement relative to its position in the field. One group of measurements may have been made across the field; in another the measurements may always have been made in the center; and in still another the measurements may have varied between these two end points. From this it seems advisable that some specification as to the size of the measuring field should be adopted in accordance with the magnification used.

From tests made using different field sizes the following reduce this error to a minimum: For projectors using a magnification of 250 diameters the field size should be no greater than a square two inches on a side; for 500 diameters, a four-inch square.

To facilitate the operator in making measurements within the required field for instruments set at 250 diameters a special shield was designed as shown in Fig. 1. It consists of a sheet of heavy white card-

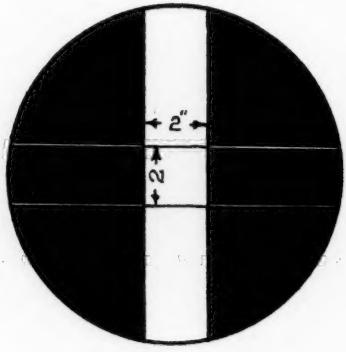

FIG. 1.

board upon which are mounted two black segments of a circle with their chords parallel, and separated by a distance of two inches. Two heavy white lines are drawn perpendicular to the chords of the segments one inch above and below the center point of the circle. Thus a two-inch square is formed at the center having the two white lines and the chords of the black segments as boundaries.

In projection, only those fibres falling within the white band are clearly defined. In making measurements the operator brings the fibres to be measured into the square before matching it to the wedge equivalent. It has been found that with this arrangement the fibres can be brought into the measuring field quickly and easily without removing the wedge from the field. A point to note is that for projectors set at 500 diameters all dimensions shown in Fig. 1 should be doubled.

Another great source of error is that of drawing the sample for a fineness determination. The fact must be realized that only a small num-

ber (approximately 10%) of all the fibres in the cross-section of a 2½ ounce sliver can be measured in any single determination and still keep the time required reasonable. Therefore, it is necessary that this 10% be representative of the top as a whole. Any haphazard method of drawing the sample cannot give reliable results. Yet there are a great number who, although very critical in the selection of their tops from analyses, pay absolutely no attention to this fact.

Relative to sampling, the question as to the minimum number of fibres for a determination has been one of considerable controversy. Some laboratories mention that 100 fibres are sufficient for all practical purposes. The validity of this statement, of course, depends on the interpretation of the word "practical." Experiment and theory have shown that the minimum number of fibres required depends on the top quality and the precision wanted in the final results. To say that any definite numbers of fibres will give the same precision for all qualities is false. To substantiate this let us consider a carefully sorted top of 70s-quality and a poorly trapped Domestic quarter-blood. The standard error, or index of the true average, will be very small for the 70s-quality due to its low dispersion factor or standard deviation even though only 100 fibres may have been measured. On the other hand, a measurement of 100 fibres of the above mentioned quarter-blood will not give even an approximation of its true quality based on average diameter, because of its large dispersion factor.

Thus, in order to have the same precision of measure in each quality, it would be advisable to keep the standard error a constant so far as possible. Since the standard error for any quality is equal to,

$$\text{S. E.} = \sigma_m = \frac{\sigma}{\sqrt{N}}$$

Where:

σ_m = Standard Error
σ = Standard Deviation
N = Number of Fibres

and since the standard deviation increases from approximately 3.5 for an 80s-quality top to 7 for a 50s-quality, it will be necessary to increase N in order to keep a constant. For standard measurements this value should be in the neighborhood of 0.2, because this represents the highest precision of the mean that can be obtained, keeping the time required for a fineness determination within commercial limits.

Using a value of 0.2 for the standard error in the formula and the average standard deviations for the qualities of 80s to 50s, Table VI illustrates the minimum number of fibres required.

TABLE VI

Quality	Standard Error	Average Standard deviation	Minimum Number of Fibres
80s	0.2	3.5	306
70s		4.0	400
64s		4.5	500
60s		5.5	756
58s		6.0	900
56s		6.5	1050
50s		7.0	1200

Taking into account the slight variations in the standard deviation, and further consolidating the minimum number of fibres required into practical commercial groups, gives rise to Table VII.

TABLE VII

Quality	Minimum Number of Fibres
80s	400
70s	400
64s	600
60s	800
58s	800
56s	1200
50s	1200

Returning again to the matter of drawing the sample for fineness determinations, it may be said that any method will give consistent results provided that the top is of a uniform blend and that the sample draws are always made in the same way. It is only when a series of methods for drawing the sample are used that discrepancies arise. Some methods are more desirable than others because of their simplicity and ease, and these methods, from a commercial point of view, should be given serious consideration.

Of all the sampling techniques that have been used in connection with top fineness measurements the staple-draw and the tuft method have been most prominent. A recent test[5] conducted by the American Society for Testing Materials, using both methods in determining the average fineness of a United States Government Standard 80s-quality top, gave the results as shown in Table VIII.

TABLE VIII

Mill Laboratory	Tuft Method Average in Microns	Staple Draw Average in Microns
A	19.5	18.5
B	19.5	20.8
C	19.6	18.8
D	19.8	19.9
E	19.3	19.6
Average	19.54	19.46

The averages of all the tests made by either method are approximately the same. The individual test averages of the tuft method have shown the least variation. The reason for this may be explained in the work done by Townend[6] on sampling and length analysis of wool.

Aside from the fact that the tuft method gives more consistent results, it is to be recommended for commercial application due to its simplicity and reliability. Also little time or elaborate technique for drawing a sample is required.

Although great care may have been exercised in drawing one sample, subsequent samples will vary in the average value due to the fibre grouping effects[7] during processing. The factors controlling the amount of

fibre grouping that takes place in a top are,

(*a*) Amount of short fibre present.
(*b*) Draft.
(*c*) Doublings.
(*d*) Type of gill box.

A theoretical discussion of gilling will point out why these factors have a direct bearing on wool top fineness measurements.

It is a well known fact that the greater the "uncontrolled distance" (the distance between the nip of the front roll and the first faller, when this faller is just about to drop) the less will be the control exercised on the short fibres. Second, fibres whose length is greater than the uncontrolled distance, but equal to or less than the distance between the nip of the front roll and the second faller just after the first faller has dropped, are also subject to grouping.

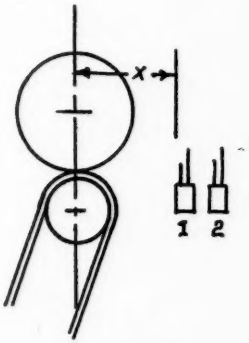

FIG. 2.

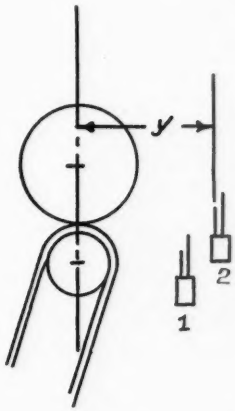

FIG. 3.

Turning to Figs. 2 and 3 for clarification: Fibres which are shorter than the distance "x" receive no pin action and are moved along in a group by the longer fibres during drafting. Fibres longer than "x" but shorter than "y" receive pin action and are controlled while faller 1 is in position, but are freed as soon as faller 1 goes out of action, as shown in Fig. 3. When this happens all the fibres controlled by faller 1, and which are "y" or less in length, are supported by the longer fibres alone and are subjected to two forces: the drafting action and the resistance of the fibres held by the fallers which have not yet come into the drafting zone. The drafting action, being greater, moves these fibres forward as a group. Thus, the short fibres (those shorter than a length "y") are subject to two distinct grouping actions: one applying to the fibres of a length "x" and less, the other to the fibres greater in length than "x" but less than "y."

Quantitatively, the amounts of short fibres in each grouping as formed by the gill box are dependent on the amount of short fibre in the comb sliver, and the distances between these fibre groupings in the top sliver are dependent on the drafts imposed in the second finisher box and the number of ends up.

Experiment [8] has shown that the fineness and length of fibre are related; *i.e.*, the short fibres are usually the finer. In an ordinary gill box the uncontrolled distance is approximately one and one-half inches (depending on the front roll diameter, the pitch of the screws, the thickness of the apron), while in an intersecting box this distance is only about one-half inch. From this it is reasonable to say that these fibre groups in a top sliver (disregarding fibre breakage), are normally the fine fibres. Thus if a sample is drawn from a top at a point where fibre grouping has taken place the chances are that the average value of diameter will be considerably less than the average of a sample taken at some other point. These variations can be reduced in a top fineness determination by taking the average of several samples at random along the length of a top sliver sample. It is also obvious that tops gilled on ordinary gill boxes are much more subject to grouping action than those gilled on intersecting boxes.

It has been the experience of those engaged in the measurement of wool top for fineness by the wedge method that novices have a tendency to measure either too fine or too coarse. Normally, after a little practice the results of their analyses will conform to those of experienced operators. These are individuals, however, who through some physical incapacity or lack of determination can never be taught to make measurements correctly.

Much has been done to reduce personal errors by the adoption of standard methods of procedure. Work is now being pushed forward by the Wool Top Committee of the National Association of Wool Manufacfacturers and the Committee D–13 of the A. S. T. M., in the preparation of test methods and top specifications. In addition to the scientific measurement values of the various grades, top samples conforming to these specifications will be available so that other characteristics such as color and handle can be determined.

Wool Top Specifications

As a result of the preceding suggestions, criticisms, and advice willingly given by the trade the Wool Top Committee of the National Association of Wool Manufacturers have drawn up a tentative wool top specification for the grades of 50s to 80s. The tops used for the bases of these specifications are all of Domestic (U. S.) wools conforming to what is considered good American trade practice. Further, the specifications will allow that freedom of grade variance that must necessarily be present in any standard of a commodity such as wool top. They are rigid, however, in the sense that any departure from the accepted methods of sorting and blending will result in a top which will not comply with the specification.

For simplification, the specifications have been designed so as to divide top fineness make-up into two major divisions, namely, a fine group and a coarse group. Sections A, B, and C constitute the fine and X, Y, and Z the coarse group. In order for a top to comply with these specifications it must meet the minimum fine requirement and must not exceed the maximum

coarse allowance and must have an average diameter falling within the specified range.

In order to clarify the interpretation of these specifications several examples are given in Table IX.

TABLE IX

FINE			COARSE			% Over	Average Diameter	Grade
A	B	C	X	Y	Z			
32	—	92	—	8	—	—	22.3	64s −
28	—	83	—	17	—	—	24.3	60s +

Top 1 does not meet the fine requirement and exceeds the coarse allowance. However it approximates a 64s grade and should be judged as a 64s minus for grade. Top 2 is a full ½ blood top exceeding the fine requirement and should be graded as a 60s plus for grade.

Conclusion

The need for a scientific method of grading wool and wool top has not only received recognition in this country but in Europe as well. It has been the experience of European countries importing and exporting wool and wool goods that serious difficulties arise in transferring the grade specified in the article by the exporting country to the equivalent grade of the importing country for the purpose of tarriff valuation.

At the International Wool Conference, held June 24–25 of this year in Warsaw, Poland, a standardization committee convened to discuss the possibility of an international wool standard and by what means this might be brought about.

A meeting of the various delegates from England, Germany, Czechoslovakia, Italy and Hungary was held in Leipzig prior to the International Conference in order to make tests using various methods and apparatus so that intelligent discussion and constructive program would result.

This International Committee deemed it necessary that the following factors must be standardized:

(1) The type of measuring apparatus.
(2) The drawing and preparation of the sample.
(3) The number of fibres to be measured.
(4) The calculation of results.
(5) The grading of the measurement.

It is extremely interesting to note that this very same program has been the one followed by the Wool Top Committee of the National Association of Wool Manufacturers in its endeavor to establish wool top standards in this country.

Another factor of importance is that none of the delegates used the cross-section method, and to quote from an article by Dr. E. Franz,[9] "Das

Verfahren, bei dem direkt unter dem Mikroskop die Querschnittsfläche ausgemessen wird, ist von keinem und benuzt worden, ein Zeichen dafür, das es zu unhandlich und umständlich ist.''

Translating: *''The method in which cross-sections of the fibres are measured direct under the microscope, was not used by any country, and is an indication to substantiate that it is too cumbersome and elaborate.''*

A point, although purely technical, brought out by Mr. Schneider of Italy, that might be given some consideration in this country should it be thought advisable to correlate our standards with those of other countries, is that of nomenclature. If the average fineness is expressed in microns then it follows that the higher spinning wools will have low micron values and the lower spinning wools will have high micron values. For example, a 70s top spinning to approximately 60s count will measure 20 microns, while a 50s top spinning to 36s count will measure 31 microns. He suggests that the fineness be expressed in terms of a metric number based on average width in microns and derived as follows,

$$\text{Area} = \frac{\pi d^2}{4}$$

Now if the density is considered a constant, then the metric number N_m will be

$$N_m = \frac{4}{\pi d^2 s}$$

Where d = Average diameter
s = Density

Table X

Quality	Fineness in Microns*	Metric Number*	Fineness in Microns (U. S.)	Quality
AAAA	16.3	3659		
AAA	17.6	3211		
AA	18.9	2780	19.0	80s
A	20.3	2530	20.0	70s
A/B	21.9	2064	22.0	64s
B	23.6	1822	25.0	60s
CI	25.4	1495	26.5	58s
CII	27.3	1313	28.8	56s
DI	29.4	1140		
DII	31.6	1032	32.0	50s
EI	34.0	840.8		
EII	36.6	735.6		

* Corrected values

Wool Top Specifications

Scope.—This standard defines the tolerance allowable in the average width, and specifies the minimum amounts of fine and average fibre and the maximum amount of coarse fibre permissible in the various grades of wool top.

Purpose.—The purpose of this standard is to provide standard methods of grading wool top and to provide permissive tolerances in these grades in order to protect the interests of the top maker, the manufacturer and user.

GRADE		80s	70s	64s	60s	58s	56s	50s
				NOT LESS THAN				
Fine Groups	Microns							
A	10-20	60%	45%	36%	18%	16%	9%	4%
B	10-25	92%	84%	--	--	--	--	--
C	10-30	--	--	94%	83%	74%	64%	45%
				NOT MORE THAN				
Coarse Groups	Microns							
X	25-30	8%	16%	--	--	--	--	--
Y	30-40	--	--	6%	17%	25%	31%	45%
Z	40-50	--	--	--	--	2%	5%	10%
Average Fineness (in microns)		18.5-19.5	20.-21.	21.5-22.5	24.5-25.5	26.-27.	27.50 29.	31.-33.
Allowance for fibers coarser than specified in schedule.		.25%	.25%	.25%	.5%	.75%	.75%	1.%
Minimum number of fibers required for test.		400	400	600	800	800	1200	1200

Using the value of 1.31 for the density of wool and expressing the average diameter in microns the formula becomes,

$$N_m = \frac{97200}{d^2} \text{ m/g}$$

In Table X are given the fineness measure of the various grades of German top in terms of average microns and metric number. The author has included also in this table the approximate American top corresponding to these grades.

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The Italian Synthetic Fibre "Lanital"

DR. JOSEF PLAIL (*Mell. Textilber.*, June 1936, P. 469–71) describes a number of tests which he carried out on the Italian synthetic fibre "Lanital," which is made from casein. The ignition tests and microchemical examination showed that Lanital fibres, with few exceptions, behave like or much the same as wool. The extraordinarily soft handle of Lanital in the loose condition brings Angora wool to mind. The microscopical appearance is similar to that of a slightly dulled rayon. The cross-section is almost without exception circular. Its strength of 3.2 grams is far inferior to that of wool of the same fineness (9.4 grams), but its breaking elongation (63.6%) is very much superior to that of wool of the same fineness (37.7%). Lanital fibre swells in water by approximately 16% and loses about 20% of its strength when it is wetted; the loss in the case of wool varies between 10 and 20%. Boiling causes a loss of strength amounting to 25%. When Lanital fibre is boiled in slightly acidified or alkaline water, instead of in ordinary neutral water, it swells greatly and the fibres become brittle when dry. There is only a comparatively slight loss of strength and elongation when the fibre is treated with a 1 to 10% solution of sulphuric acid, or potassium or sodium hydroxide at ordinary temperature. The average loss of strength in a 1% solution of soda or soap at 80° C. (136° F.) amounts to from 18 to 22%, but does not rise above about 3% at a temperature of 40° C. (104° F.). The fibre becomes harsh and brittle when dyed in an acid bath at the boil, but the tendering does not rise above from about 6 to 9% when it is dyed at a temperature below the boiling point. Experiments are proceeding with shorter staples on cotton-spinning machines. (From *Interntl. Cotton Bulletin*, July 1936, P. 468.)

Microbiology of Textile Fibres

V. Method for the General Histological Examination of Normal or Mildewed Cotton Fibres

By BRYCE PRINDLE *

Summary

A method † is presented for detecting and observing changes in the histological structure of cotton fibres during the course of biological mildew development. Fibre elements are first stained by the use of a 0.15% aqueous solution of Victoria Blue B. Swelling of the dyed fibre in cuprammonium solution containing not more than 0.8% copper is then used to accentuate and separate the finer structures for microscopic observation. The appearance of typical samples of normal raw cotton and badly mildewed raw cotton are shown in a series of eight photomicrographs.

Introduction

IN the course of experimental investigation of the process of mildew in raw cotton it was found necessary to make frequent examinations of small samples of infected fibre for the purpose of estimating the progress of histological breakdown caused by the invading microorganisms. The requirements of a method for making such examinations are, first, that it should bring out the minute details of structure in widely different samples and, second, that it be simple and rapid, since it must be applied often.

An experimental trial of a large number of published methods for the histological study of cotton fibre showed that no single method could give the desired results. Swelling methods were very useful in separating the fibre elements from one another, but details were poorly differentiated. Staining methods were successful in dyeing the substances in the cuticle and lumen, but the fact that one was completely enclosed within the other made

* Dr. Prindle is working under the direction of Dr. Samuel C. Prescott, Massachusetts Institute of Technology, Cambridge, Mass. This is Contribution No. 77, Dept. of Biology and Public Health.

† Author's Note.—Since the completion of this paper, there has come to the attention of the author a publication of Karl Küsebauch entitled "Beiträge zur Anatomie der Baumwollfaser" and published in the *Melliand Textilberichte 17*: 18–21 (1936). In his report, Dr. Küsebauch reviews the last work of the late Dr. W. Sieber on the use of Victoria Blue B as a histological stain for cottton fibre, and presents additional research of his own regarding the use of the above-mentioned dye followed by cuprammonium swelling reagent. The microscopic appearance of stained and swollen samples of several types of raw cotton fibre is illustrated by means of a series of photomicrographs in color.

It is interesting to note that the observations independently arrived at in my work are in complete agreement with those of Dr. Küsebauch. This agreement confirms the utility of the method.

them hard to distinguish. A combination of these methods was therefore suggested as the logical solution to this problem.

The first step in devising a combination method was the choice of a suitable swelling reagent. There are three which are extensively used in observing the finer structure of cotton: cuprammonium, carbon disulphide-sodium hydroxide solution, and "critical" sulphuric acid. After laboratory trials of these three, the cuprammonium was selected as being the most useful. It is easily prepared and can be kept for long periods of time if properly stored. The concentration of copper in the solution is easily controlled and is directly related to the rate of swelling of fibres. Conversely, the strength of cuprammonium solution needed to swell any given fibre sample in a given time is a measure of the soundness and maturity of the fibre structure. A trial of various dyes for staining the cuticle and lumen substances of raw cotton led to the choice of Victoria Blue B, which, for some time, has been known to serve reliably in this capacity.

Reagents

Cuprammonium Solution:— Copper content, 0.8%.

1. Dissolve 15.7 grams of $CuSO_4 \cdot 5H_2O$ in 100 cc. dist. water.
2. Precipitate the copper as copper hydroxide with 6N NaOH soln. (about 25 cc.).
3. Filter off the hydroxide and wash with water until free of sulphate ion.
4. Dissolve in 500 cc. of 15.5% NH_4OH, and store in tightly stoppered brown glass bottle.

Victoria Blue B Stain:—0.15% aqueous.

1. Dissolve 0.15 gram of Victoria Blue B in 100 cc. distilled water and shake until dissolved.

Procedure

Staining:—

1. Add to sample of cotton to be examined (about 0.1 gram is usually convenient) enough Victoria Blue B solution to be in excess of that required for complete wetting out (about 15 cc. per 0.10 gram sample). This step may be conveniently carried out in an 8-inch pyrex test tube.
2. Boil for one minute.
3. Wash with cold water until no more color comes off.
4. Boil with fresh distilled water until no more bleeding of color from sample is observed.
5. Rinse the sample again with cold water and allow to drain and dry on a piece of filter or blotting paper.

Swelling:—

1. Prepare for this step by having ready to hand: microscope, clean micro-slides, clean cover-glasses, a dropping bottle half-full of cuprammonium solution, a small pair of forceps and two needles.
2. Choose the part of the stained, dry specimen which it is desired to examine microscopically. Breathe gently on the top surface of a clean slide and on the fibre sample. This will greatly facilitate handling by reducing the tendency of the fibres to fly. Pull a

few fibres from the mass with the forceps and lay them parallel with the longitudinal edge of the slide.

3. Place a few drops of the cuprammonium solution on the fibres and finish the mount with a cover glass. Examine under the microscope at about 100 ×. It will be observed that the solution prepared as described is too concentrated for all but the most resistant of cotton samples. The proper dilution for the sample at hand

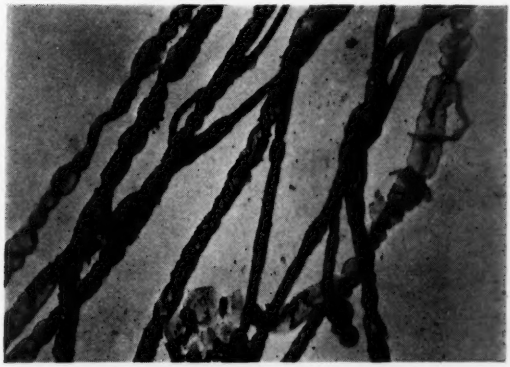

FIG. 1. Appearance of swollen fibre under dissecting objective of microscope showing beaded appearance.

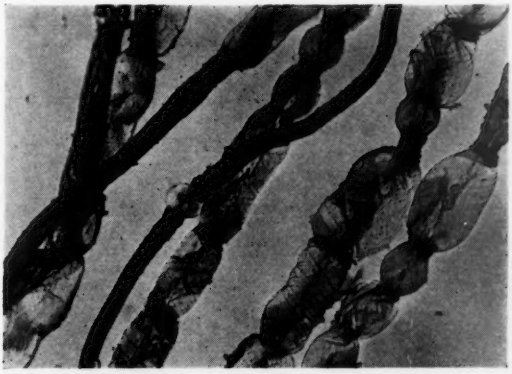

FIG. 2. Part of the same fibres as in Fig. 1 under 16 mm. objective, showing stained cuticle at nodes, stained material in the lumen and spiral fibrillae.

must be determined by adding small amounts of distilled water to the cuprammonium solution in the dropping bottle and observing the loss in swelling rate on fresh samples of fibre.

4. Cover the width of a slide, placing the fibres parallel, in the stated manner; wet the fibres with several drops of cuprammonium solution of the correct concentration and place a cover slip over the whole, taking care to displace air bubbles.

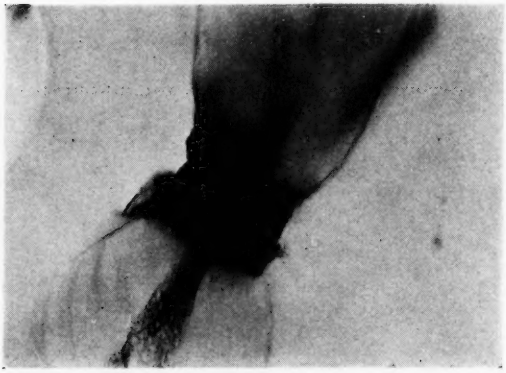

FIG. 3. Details of stained cuticular and lumenar substances which remain after the cellulose of the secondary wall has been regarded by the cuprammonium solution, as seen with 4 mm. objective.

FIG. 4. Details of node between "beads" showing details of cuticle and material in lumen, as seen with 4 mm. objective.

5. Place the slide on the microscope for observation as soon as possible after mounting. Observe the rate and manner of swelling of the test fibres as well as their final appearance.

Observations

Macroscopic:—Normal samples of sound raw cotton will usually be stained an even dark purplish-blue by the aqueous Victoria blue B. In the

FIG. 5. Typical appearance of mildewed fibre under dissecting objective showing general absence of strictures caused by resistant cuticle and the bunching of fibres which were parallel before swelling.

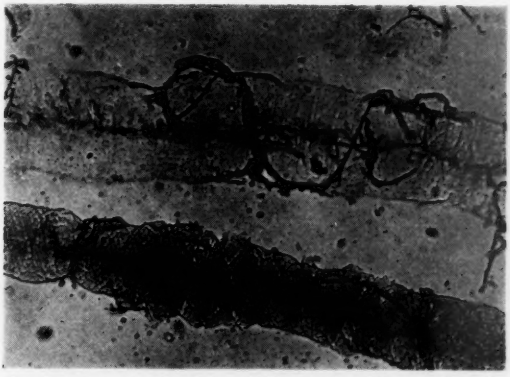

FIG. 6. Appearance of mildewed fibre under 16 mm. objective showing absence of cuticle. Material in lumen is stained, and fibrillar structure is easily made out. The large black fibrous objects are possibly mold hyphae stained with Victoria Blue B but not swollen by the cuprammonium.

case of mildewed specimens, however, the stained samples are usually mottled with a lighter and clearer blue. This is probably due to the fact that the dye can act as a pH indicator, being blue in the acid range and purple in the alkaline range. As the mildewed spots in a mass of fibre are usually acid, they appear bright blue in the stained specimen, and the attacked fibres are easily picked out for swelling and observation. This is an extremely useful characteristic of the stain, as it frequently happens that badly mildewed spots are not well distinguished from contiguous normal fibre either by their color or physical characteristics.

FIGS. 7, 8. Views of swollen mildewed fibre under 4 mm. objective showing details of fibre structure, and filaments which are probably mold hyphae in lumen of the cotton fibre.

Microscopic:—Microscopically, the swollen fibres present a morphological picture very similar to that obtained in the swelling test of Thaysen and Bunker. The normal fibres have a beaded appearance under the lower powers of the microscope, which upon closer inspection is found to be due to the bulging of swollen cellulose of the secondary wall between constricting collars of resistant cuticle. In the case of the mildewed fibres, swelling takes place more readily and the whole fibre swells evenly. As in the case of the swelling test of Thaysen and Bunker, details of the structure of the secondary wall may be made out by careful use of illumination. The outstanding advantage of this method, however, lies in the ease with which the state of the material in the lumen of the fibres and the cuticle may be observed. Both of these, as well as any micro-organisms which may be present, are stained by the Victoria Blue, which, upon application of the highly alkaline cuprammonium swelling agent, turns to a dark reddish purple. The finest structure of these fibre elements may then be readily differentiated from the secondary wall and observed visually with ease. If it is desired to record observations photomicrographically, the dark reddish color of the stain allows the taking of pictures of high quality with unfiltered white light, using orthochromatic plates or film.

The microscopical appearance of typical samples of normal and badly mildewed raw cotton are show in Figs. 1 to 8 inclusive.

Research and Dividends

"Research is a term that has been grossly abused. It is used very glibly by many well-meaning people, as a sort of cover-all when referring to scientific pursuits. Industrialists use the term particularly easy. They refer to research of this, research of that. If they were asked for one per cent of the profits to finance research, there is no doubt that the term would disappear from their vocabulary. Research requires money, time, equipment and personnel. It may take weeks, months or years before the objective is reached but during the process much valuable information is uncovered. Most well supported and properly conducted researches pay huge dividends, as witness the steel and rubber industries. Unfortunately, when a research laboratory becomes available to an industry the flood of problems and inquiries forces it to evolve itself into an analytical routine laboratory, at the expense of pure research." *

* W. A. Lucas, in paper read at meeting of the Ontario Section, Canadian Association of Textile Colorists and Chemists held at the Ontario Research Foundation, Toronto, May 2, 1936. *Am. Dye. Rptr.*, June 29, 1936.

"Textile Waste Treatment and Recovery"

UNDER the direction of, and financed by the Textile Foundation, Inc., a survey of present knowledge concerning the treatment and disposal of waste waters produced in the textile industries has been completed by John C. Geyer and William A. Perry, with co-operation of the University of North Carolina, and in council with Dr. H. G. Baity, dean of engineering, and an advisory committee on textile waste treatment. The report is contained in a booklet of 118 pages and is published by the Textile Foundation, Commerce Building, Washington, D. C., at $1.00 per copy.

This survey follows a series of studies on the "Disposal and Recovery of Textile Waste Liquors" conducted under the direction of Dr. H. G. Baity, by M. S. Campbell, Fellow of the Textile Foundation, at the University of North Carolina and Proximity Print Works, Greensboro, N. C., from September, 1932, to January, 1935, four reports of which were published in TEXTILE RESEARCH. Mr. Campbell left the work in January, 1935, and in the spring of that year the Board of Directors of the Textile Foundation expressed the wish "that more data and information should be secured concerning studies completed and under way in different parts of the country on projects related to the disposal and recovery of textile wastes." The survey of textile waste treatment was initiated and this report sets forth the information collected. It should be of value to textile men and engineers as a summary and correlation of information, and as a guide to future research. The report consists of two major parts: The first, a non-technical discussion of all phases of the problem; the second, a detailed presentation of technical information. This division allows textile men to obtain a general picture of waste treatment and recovery without confusion with the detail which is of basic interest to engineers. A bibliography is referred to throughout both parts of the report by use of reference numbers. This bibliography, which is quite complete, is one of the most valuable parts of the report and should be particularly useful to those who wish to go into the subject of textile waste treatment in considerable detail.

The advisory committee which co-operated with Dr. H. G. Baity and the authors in the organization and preparation of the survey is as follows: C. R. Hoover, professor of chemistry, Wesleyan University and technical advisor for the Connecticut State Water Commission; Dr. Willem Rudolfs, chief, Division of Water and Sewage Research, New Jersey Agricultural Experiment Station; T. R. Camp, associate professor of sanitary engineering, M. I. T.; H. W. Streeter, sanitary engineer, U. S. Public Health Service; H. M. Hunter, general manager, Proximity Mfg. Co., Greensboro, N. C.; A. H. Grimshaw, professor of textile chemistry and dyeing, N. C. State College Textile School; Dr. A. M. White, professor of chemical engineering, Univ. of North Carolina; Dr. F. K. Cameron, professor of chemistry, Univ. of North Carolina.

Summary and Conclusions

Although it is not possible to summarize all the information presented in this report, there are certain important points concerning the treatment and recovery of textile wastes which merit final emphasis.

1. The treatment of textile wastes becomes necessary when the purity of a stream is damaged to the extent that a nuisance is created or serious economic losses are incurred by users of the stream for purposes other than waste disposal.

2. Different standards of purity should be selected for various streams depending upon the purposes for which they are used, and the textile wastes discharged should then be purified sufficiently to maintain these stream standards.

3. There are not many possibilities for realizing a profit from the recovery of by-products, but frequently when waste treatment is required, recovery or re-use offers a means of reducing the overall expense of disposal. The volume of waste to be purified may be materially reduced by the use of modern equipment and the careful control of operations within the mill.

4. Although many textile waste treatment plants have been built which operate satisfactorily, there are wide differences of opinion as to which methods are most satisfactory for treating the various textile wastes.

5. Since wastes from different mills differ in character, some experimentation at each mill is required in order to select the proper treatment.

6. Chemical precipitation methods have been found to provide satisfactory and usually sufficient treatment for wastes which are not exceptionally high in organic content, *e.g.*, wastes from dyeing and finishing operations, while chemical precipitation followed by mechanical filtration or biological purification is generally required for the wastes containing large amounts of organic matter, *e.g.*, wastes from deterging operations. Soaps, oils and waxes in a waste interfere with chemical precipitation. Certain dye wastes which do not respond to chemical precipitation must be purified by bleaching or by using an absorptive material to remove the color. The cost of treating a waste by chemical precipitation generally lies between 10 and 20 cents per 1000 gallons. The satisfactory operation of any treatment plant depends on scientific and conscientious control.

7. Where possible, the best method of disposing of textile wastes is to discharge them into the domestic sewers. Some preliminary treatment of textile wastes will frequently be required. When the municipal sewage is treated biologically, sulphur dye wastes and certain other wastes should never be discharged into the domestic sewers without preliminary purification. The presence of textile wastes in domestic sewage materially increases the expense of operating a municipal disposal plant. This additional expense should be properly apportioned among the manufacturers.

8. Past research has related almost entirely to the solution of local problems. This past work has been, for the most part, the trial and error type of experimentation. Fundamental research is needed to determine the colloidal and electrical nature of the substances carried in textile wastes and to work out methods for removing the various types of polluting matter.

9. Co-ordination of research and dissemination of information by an organization supported by the textile industry is desirable.

Each textile waste disposal problem involves so many complicating fac-

tors that its solution must not be undertaken hurriedly. The requirements in each case must provide for justice and must be founded on sound principles of economic conservation. A thorough study of the technical phases of each problem is necessary. The solution of these complex problems can be attained only by continuous endeavor and by sympathetic co-operation on the part of both the manufacturer and the authority.

The Drying Research Project

"AT the conference on textile drying sponsored by the United States Institute for Textile Research, Inc., and held in New York City on May 6th, several formal papers discussing the drying of textile fibres were presented which were followed by an open discussion participated in by many of the 150 representatives who were present. It was the consensus of opinion at this confcrence that the U. S. Institute should sponsor a research project covering the subject of textile drying. The only thing needed to put this project under way was sufficient co-operative financing to carry on the needed work.". . . "As was very clearly brought out at the May conference there can remain no doubt as to the need of a research project covering the subject of textile drying in view of the present lack of scientific information regarding the best drying conditions for the different textile fibres. The value of the research project to textile manufacturers was summed up quite neatly in one of the statements heard during the discussion: 'I venture to say, although there are no figures to support this, that if the money that is spent by all of us in claims on goods that have been damaged by excessive drying could be applied to ideal drying equipment and drying methods perhaps that would solve the profit and loss element in this thing.' If the conditions were known under which drying could be carried on, not only most economically, but also most safely and which would produce the desired effect on the quality of the goods then there would be no need for a research project on the drying of textiles, but as this knowledge is lacking or incomplete there is a definite need for the proposed research.

"This project represents an opportunity for the textile manufacturers, the drying machine and control instrument manufacturers, to contribute to a work that no single manufacturer could carry on alone except under conditions that would prove many more times as expensive. It is an opportunity that no one who has drying problems (and who hasn't?) can afford to pass up. It is to be hoped that the amount of money necessary to finance this research will be forthcoming shortly."—*Am. Dye. Rptr.*, Aug. 10, 1936, P. 439.

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One of the notable pieces of research work now in progress involves the development of a new type of X-ray diffraction diagram, which will require little, if any, interpretation to be intelligible to others than experts in this science. Dr. Go had worked previously at Berne on this study, and now has Dr. Yagi's assistance.

Abstracts

This section is compiled under the direction of the Committee on Abstracts and Bibliography: Prof. E. R. Schwarz, Chairman, M. W. Weiss, Dr. Irving J. Saxl and C. H. Clark.

I. Fibres (Synthetic and Natural) and Fibre Analysis

Absorption of Caustic Soda by Cellulose. S. M. Neale. *J. Phys. Chem.*, Dec. 1935, P. 1245; *Cotton Literature*, Mar. 1936, P. 96.

Further observations on the phenomena recorded by Bancroft and Calkin in their paper on the same subject are given. (C)

Artificial Silk from Casein. (German.) Dr. Wilhelm Bader. *Die Kunstseide*, March, 1936, P. 117–9.

Some years ago Dr. Wilhelm Bader, an Austrian chemist studied the spinning of casein and arrived at very favorable results. Contrary to Totenhaupt, who first prepared casein filaments, he used casein solutions with the addition of carbon disulphide. The author observes in this article that the casein solution, like viscose, undergoes a certain ripening process and that the best working conditions can only be found empirically. Casein solutions are spun by the usual devices of the viscose rayon industry. The composition of the sulphuric acid precipitating bath seems to exert a great influence upon the quality of the filament. (S)

Egyptian Cottons: Correlation of Certain Characters in. C. H. Brown. *Emp. Cotton Gr. Rev.*, 1935, V. 12, P. 216–20 (through *Plant Breeding Abs.*, 1936, V. 6, P. 111).

The close correlation between seed weight and hair weight per cm., found in the present strain (Giza 19) and probably occurring in all the other strains, too, indicates that purification for seed size automatically gives the greatest possible purity for fineness. (From *J. T. I.*, Mar. 1936, P. A99.) (C)

Cotton Experiments: Studies of the Sampling Technic in. I. Sampling from Locks. K. S. Cheng, Y. T. Su and C. J. Young. *Kwangsi Agr. Expt. Sta. Bull.*, 2, 40 pp., tables. Kwangsi, China. July, 1935. In Chinese, with English summary, pp. 37–40.

Differences in certain seed and lint characters from seeds located in different parts of lock has been shown by these investigations to be both consistent and significant, and similar results were obtained for both Chinese and American cottons. Systematic method of sampling is not

considered wise, since the seeds will be biased and the errors accumulative. (C)

COTTONIZED FLAX PRODUCTION. *Tex. Mfr.*, 1936, V. 62, P. 76.

Refers to reports of experiments on the use of flax fibre on cotton machinery, and it is indicated that the experiments are not with the waste from flax, but with normal flax. The flax is not pulled and retted in the ordinary way, as it is proposed to mow it and treat it by the Franklin-Smith process. A caution has been issued by the National Farmers' Union against undue optimism in expecting any rapid extension of flax growing in this country. (From *J. T. I.*, Mar. 1936, P. A104.) (C)

DELUSTERING OF RAYON. A. Prior. *Monatsh. Seide Kunstseide*, 1935, V. 40, P. 415–20, 456–8, 460, 462, 500–3.

A detailed survey dealing with the Foulard delustering method, the black-dull finishing operation, historical development of the technic, spinning and piece delustering, luster as a factor in the textile industry and the patent literature. (From *C. A.*, 1936, V. 30, Col. 1569.) (W)

ELASTICITY OF CELLULOSE. K. H. Meyer and W. Lotmar. *Helv. Chim. Acta*, 1936, V. 19, P. 68–86.

The modulus of elasticity of cellulose and some of its derivatives has been determined by static and acoustic methods, as a function of the humidity, temperature, orientation and tension. The positive thermal coefficient of tension, characteristic of rubber, is only apparent in the case of cellulose acetate films. In all other cases, the values are negative or zero and the elasticity is due to the molecular forces of valency. The modulus of elasticity of highly orientated native cellulose, *e.g.*, ramie or linen, is about 11,000 kg. per sq. mm. $\pm$ 10%, and of regenerated cellulose or its derivatives is 100–5,000 kg. per sq. mm., defects in structure being responsible for the lower values. (From *J. Soc. Dyers Col.*, April 1936, P. 152.) (C)

FIBRES: ELECTROKINETIC POTENTIALS. N. and A. Andô. *J. Chem. Soc. Japan*, 1934, V. 55, P. 968–78 (through *C. A.*, 1935, V. 29, Col. 660).

The electro kinetic potentials at the interfaces between cotton, silk, and wool fibres and water were measured by the streaming-potential method. The potentials are negative. (From *J. T. I.*, Feb. 1936, P. A76.) (C)

HOFA FIBRE—A NEW VISCOSE PRODUCT. (GERMAN.) Dr. Marta Halama. *Die Kunstseide*, March, 1936, P. 114–6.

This fibre is intended to substitute for hemp, jute, ramie, or other natural fibres. In production, it resembles viscose rayon. The difficulties arising in mixing can probably be overcome. The spinning mass, in manufacture, is very viscous and cannot be spun through nozzles with fine orifices. On the contrary, the fibre is formed as a sort of horsehair in a normal spinning bath at a low temperature. The after treatment is accomplished on bobbins or in the pot. The finished filament is somewhat rougher than horsehair, resists knotting and resembles hemp threads. Photomicrographs show the distribution of wood fibres in the viscous mass. (S)

II. Yarns and Fabrics

Silk: Effect of Tin Weighting on the Air Permeability of. II, IV. Nellie M. Roberts and Pauline B. Mack. *Rayon & Mell.*, 1936, Jan., P. 49; Feb., P. 67.

Experimental studies are reported on the air permeability of six pieces of silk originally from the same bolt but varying in percentage of mineral weighting. The permeability of any air pressure was found to be less, the greater the percentage of weighting. (C)

(New) Sizing Material for Acetate and Other Synthetic Warp Yarns. H. C. Roberts. *Rayon & Mell.*, Jan. 1936, P. 79. (C)

Sizing Staple Fibre Warps. *Silk J. and Rayon Wld.*, 1935, V. 12, No. 137, P. 37.

If too adhesive size mixtures are used for staple fibre yarns, removal is difficult, and over-scouring may result. Recipes are given for two suitable mixtures, containing soft soap to prevent the fibres sticking to the drying cylinder. The use is recommended of gum Tragon which gives strength to the yarns but is easily removed. (From *J. T. I.*, Jan. 1936, P. A10.) (C)

Slashing Cotton Warps. Robert Burgess. *Tex. Wld.*, Feb. 1936, P. 67.

Use of ribbed-reel-type of immersion roll to give better penetration of size is described. (C)

Spraying of Textile Fibres. A. H. Milnes. *Tex. Mfr.*, Feb. 1936, P. 46.

Various methods for spraying textile raw materials and the principles governing type and velocity of spray are described. (C)

Synthetic Yarns and Their Reaction in the Boil-off. W. L. Bentley. *Rayon & Mell.*, Jan. 1936, P. 56 (C)

Tensile Strength of Manila Yarns and Manila Rope. C. A. Lobry de Bruyn and J. M. A. Kruger. *J. T. I.*, Jan. 1936, P. T1–12.

The calculation of probabilities has been applied to a great number of available data on the tensile strength of manila yarns and ropes. Typical Gauss curves have been obtained. The variation in strength of the rope is calculated from the variation in strength of the yarns; also the calculated relation between this variation and the increasing diameter of the rope has been compared with the results of experimental data. In conclusion, the influence of the testing length on the tensile strength is calculated. The results have led to the drawing of several conclusions, which must be considered in specifying and testing. (C)

Textile Finishing: Recent Developments in. L. G. Lawrie. *J. T. I.*, Nov. 1935, P. P375–8.

A lecture by L. G. Lawrie, A. I. C., of Imperial Chemical Industries Ltd., at a meeting at the Textile Institute, Manchester, Eng. Among the new developments mentioned were the following: (a) Waterproof finishes obtained by the esterification of fibres by the agency of the chlorides of the

higher fatty acids. The waterproofing effect was accompanied by a marked softness of handle and the proofing withstood normal dry cleaning treatment. (b) The immunization of cotton by acetylation or benzoylation was a similar example. (c) Softening agents which have a definite affinity for the fibre. To promote the crêping of rayon crêpe cloths assistants such as soap and phenol had been replaced by a sulphated fatty alcohol and emulsified pine oil. The crêping effect was increased and softer handling fabric results. Synthetic resins had proved useful as adhesives and as anti-slip assistants in plain rayon fabrics. In the case of acetate rayon, solvent emulsions employed in conjunction with heat rendered the fibre plastic and permitted pattern glaze effects to be produced. (C)

VARIABLE SPEED SPINNING. *Tex. Wld.*, Feb. 1936, P. 64.

Describes advantages, and some disadvantages, of the Reeves drive as used on filling-wind frames with 9-in. lift and 2¾-in. rings, spinning 8s to 30s cotton yarns. Comparative data for variable- and constant-speed are given. An increase in production of 17 to 18% is claimed. (C)

WIDTHS AND LENGTHS AND YARN CONTRACTION IN COTTON CLOTHS. III. H. Barlow.

Some of the factors influencing amount of contraction in weaving. Plain weave contractions. (C)

WOOLEN CARDING ENGINE—PRESENT AND FUTURE. P. P. Townend. *J. T. I.*, Aug. 1935, P. P318–25.

The following four points are emphasized: (1) The production of a good level yarn; the standard depending on the class of work. (2) Production itself. A carding machine can only handle a certain amount of material; above that the fancy is not able to cope with it. This suggests that the first step to increased production is a more efficient fancy. (3) Simplicity of operation. (4) The machine must be adaptable; today, more than ever before, small blends are too common and, furthermore, vary greatly in quality. It should always be borne in mind that a carding machine is not like a penny in the slot machine except in so far that it will reject any unsuitable material. Thought should be given to the condition and clothing of a machine before blends are put on it. (C)

WORSTED SPINNING: EXPERIMENTAL STUDY ON "DRAWING STRESS" IN. C. Gégauff. *Rev. Text.*, 1935, V. 33, P. 223–7, 283–5, 355–9, 417–23, 493–7.

The following relations have been found to apply to the drafting of fibres such as wool, cotton, etc.: (1) The frictional drag or "drawing stress" is directly proportional to the weight of the drafted sliver and is practically independent of the initial weight of slubbing and the draft, provided that the latter is greater than two; (2) for wools of different average lengths on the same machine, the drag is approximately proportional to the average fibre length; (3) other things being equal, the drag does not vary greatly from one machine to another, except in the case of the circular porcupine roller control, which may increase the drag three times. (From *J. T. I.*, Nov. 1935, P. A557.) (C)

YARN STOP MOTION. C. Sterbecq and Soc. Mathon et Debrulle. *Rev. Fil. et Tiss.*, 1935, V. 20, P. 373–5.

A description is given of a device ensuring the stopping of any textile machine as soon as the yarn or roving has broken, or is on the point of breaking, in its passage across the machine. The device consists of a rocking lever supported on each side by a thread, so that if either of these is interfered with, equilibrium is disturbed, and a mechanism for stopping the machine is at once put into action. (From *J. T. I.*, Jan. 1936, P. A8.) (C)

YARN TWIST: EFFECT OF—ON THE PROPERTIES OF CLOTH. H. F. Schiefer and D. H. Taft. *B. S. J. Rsch.*, Feb. 1936, P. 131–8.

The effect of warp and filling yarn twist on the breaking strength, elongation at rupture, and fabric assistance of cotton cloth is discussed for the plain and 2/2 basket weaves. In both weaves the number of warp and filling yarns per inch of cloth was kept constant at 34. The cloths were woven from 10s cotton yarn in various combinations of warp and filling twist multipliers, which varied from 2.5 to 9. The breaking strength and elongation at rupture of the cloths vary approximately with the breaking strength and elongation at rupture of the yarns from which the cloths were woven. The fabric assistance varies inversely with the breaking strength of the yarn. The direction of twist in the yarn has no significant effect on the results. The breaking strength, elongation at rupture, and fabric assistance are greater in the plain weave than in the 2/2 basket weave. The cloths were tested by the grab and strip methods, and the effect of the method of test is shown. (C)

III. CHEMICAL AND OTHER PROCESSING (NOT OTHERWISE CLASSIFIED)

AMYLOSE: MOLECULAR SIZE. D. K. Baird, W. N. Haworth and E. L. Hirst. *J. Chem. Soc.*, 1935, P. 1201–5; *J. T. I.*, Nov. 1935, P. A595. (C)

ARSENIC PROBLEM. M. J. Reuter. *Arch. Dermatol. Syphilol.*, 1935, V. 31, P. 811–18.

Report of a case of probable arsenic dermatitis from wearing apparel. Analysis of the suit cloth causing the dermatitis showed 0.013 mg. As per g. material, apparently incorporated in the aniline black dye used. (From *C. A.*, 1936, V. 30, Col. 619.) (W)

AZOIC DYES IN COTTON DYEING. E. B. Adams. *J. Soc. Dyers Col.*, Jan. 1936, P. 5. (C)

STARCH: REACTION WITH DILUTE ALKALI. M. Samec. *Bull. Soc. chim. Yougoslavie*, 1935, V. 4, P. 71–8 (through *Chem. Zentr.*, 1935, i, P. 3669); *J. T. I.*, Nov. 1935, P. A598. (C)

STARCH AND DEXTRIN SOLUTIONS: BEHAVIOR OF—IN THE PRESENCE OF THE USUAL AGENTS ADDED FOR FINISHING AND SIZING. H. Kober. *Mell. Textilber.*, 1935, P. 734.

The author describes the results of a number of systematic trials which he carried out with a series of solutions of starch products which are com-

monly used in the textile industry. These may be summarized as follows: 1. Solutions of similar textile starches may show great differences in respect of turbidity. 2. The addition of moderately strong solutions of salts or capillary active agents does not increase the turbidity much. 3. The addition of even weak solutions of salts and capillary active agents causes a pronounced change of the flocculation threshold and in a short time brings about more or less marked turbidity of flocculation. 4. Clearness of the solution does not involve clearness of the films. 5. The behavior of starch solutions in the presence of capillary active agents and electrolytes permits of drawing extensive conclusions about the constitution of the product and may be regarded as a valuable test for textile starches, perhaps in conjunction with other tests. 6. It was found that the content of molecularly disperse constituents tends to vary in commercial starches and their solutions in consequence of the hydrolyzing and consequently decomposing action of water. 7. The differences in the behavior of solutions of textile starches in respect to turbidity were found to be due to differences in their internal structure. Solutions which readily tend to flocculate are irregular in their composition, while solutions that remain clear are homogeneous and break down within definite narrow limits. (From *Rayon & Mell.*, Feb. 1936, P. 88.) (C)

SUBSTANTIVITY. E. Schirm. *J. pr. Chem.*, 1935, V. 144, P. 69–92; *J. Soc. Dyers Col.*, Feb. 1936, P. 70. (C)

SULFONATED AND FREE FATTY ALCOHOLS. E. Gibson. *Silk and Rayon*, 1935, V. 9, P. 589.

The uses of these compds. in finishing silk and rayon are discussed. (From *C. A.*, 1936, V. 30, Col. 292.) (W)

SULFONATED AND SULFATED OILS: DETERMINATION OF ACTIVE INGREDIENTS AND TOTAL FATTY MATTER IN. Ralph Hart. *Ind. Eng. Chem.*, May 15, 1935, P. 137–40. (C)

SULFUR TRIOXIDE: COMPARATIVE TESTS FOR VALUE OF—IN DIFFERENT AMOUNTS IN SULFONATED COMPOUNDS. A. H. Grimshaw. *Am. Dye. Rptr.*, Jan. 27, 1936, P. 35. (C)

SULPHATED FATTY ALCOHOLS. A. F. Kertess. *J. Soc. Dyers Col.*, Feb. 1936, P. 42.

A lecture in which the commercial sulphonated fatty alcohols and their derivation are discussed, and also their various applications in the textile industry. (C)

SYNTHETIC RESINS: THEIR APPLICATION TO TEXTILES. D. H. Powers. *Am. Dye. Rptr.*, Feb. 10, 1936, P. 71. (C)

TREATMENT OF TRADE WASTE WITH ACTIVATED CARBON. F. D. Snell. *Ind. Eng. Chem.*, 1935, V. 27, P. 825 (through *Water Pollution Res. Bd. Abs.*, 1935, V. 8, P. 356); *J. T. I.*, Nov. 1935, P. A588. (C)

VAT COLORS: NEW DEVELOPMENTS IN THE APPLICATION OF—ON COTTON PIECE GOODS. S. H. Williams. *Am. Dye. Rptr.*, Feb. 24, 1936. (C)

VAT DYES: METHOD FOR THE IDENTIFICATION OF. G. Buzzi-Ferraris. *Boll. assoc. ital. chim. tessile*, 1935, V. 11, No. 1, P. 1–6; *Chim. et. Ind.*, V. 34, P. 1182; *C. A.*, 1936, V. 30, Col. 1233.

The method, based on the analogy of color and sound, consists in observing changes in tone. Of the various reagents which can modify chiefly the tone of vat dyes, two are particularly simple to use, *viz.*, hyposulfite in alk. soln. and 66° Bé. H_2SO_4. (W)

VAT PRINTING PASTES: FUNDAMENTAL STUDY OF. I. Correlation of Physical Properties and Printing Quality. Sivert N. Glarum, Research Associate, A. A. T. C. C. *Am. Dye. Rptr.*, Mar. 23, 1936, P. 150–57.

A method is described which may be used to compare and standardize the flowing properties of printing colors and similar pastes. The flow curves obtained by this method permit accurate comparisons to be made between pastes containing totally different thickeners which cannot be compared by the usual methods of examination. The data obtained from five print works show that the flowing properties of vat printing colors must be held within certain definite limits if the pattern produced on the fabric is to be an accurate reproduction of the pattern engraved on the roller. These limits have been established. The effect of the temperature of the printing roller on the quality of printing has also been shown. (C)

WARP SIZING. Paul Seydel. *Cotton*, 1936, Jan., P. 55; Mar., P. 63; Apr., P. 74; May, P. 68–70; June, P. 60–1.

The third article of this series discusses gums and glues; the fourth, the fats, lubricants and softeners as used in sizing, and continues discussion of this process; the filth, the deliquescents and preservatives as used in sizing. The sixth instalment covers the weighting materials as used in making warp sizing and finishing compounds. (C)

WETTING AGENTS: DETERGENT ACTION IN HARD WATER. K. Lindner. *Textilber.*, 1935, V. 16, P. 782–6; *J. T. I.*, Mar. 1936, P. A116. (C)

WOOL: ACTION OF REAGENTS UPON. Jas. F. Holmes. *Tex. Col.*, May 1936, P. 314–17. (C)

WOOL DYEING: THEORY OF—WITH PARTICULAR REFERENCE TO ACID DYED IN COLLOIDAL SOLUTION. F. L. Goodall. *J. Soc. Dyers Col.*, 1935, V. 51, P. 405–14.

A summary of available information and some theoretical considerations tending to make clear the fundamental difference in behavior in relation to wool, between dyes colloidally dispersed and those almost completely ionized in soln. Nineteen references. (From *C. A.*, 1936, V. 30, Col. 868.) (W)

WORKING WITH VACUUM. Teufer. *Z. ges. Textil-Ind.*, 1935, V. 38, No. 43, P. 10.

Applications in the textile industry are briefly discussed in connection with dyeing and drying. (From *C. A.*, 1936, V. 30, Col. 293.) (W)

IV. Research Methods and Apparatus

Artificial Resins and Celluloses: Tensile Strength; Influence of van der Waal's Forces. J. H. de Boer; K. H. Meyer. *Trans. Faraday Soc.*, 1936, V. 32, P. 10–38; *J. T. I.*, Mar. 1936, P. A146.

The question of the mutual orientation of molecules under the influence of van der Waal's forces is discussed. In the discussion on this paper K. H. Meyer reports that the calculated value for the modulus of a cellulose-chain from a spatial model, taking into account both the valency-oscillations and the deformation oscillations, was $10{,}000 \pm 2{,}000$ kg/mm.^{2}, and the modulus of well-oriented natural cellulose fibres, measured by an acoustic method, was approximately 11,000 kg/mm.^{2} This affords direct evidence for the primary valency chain formula of cellulose. (C)

Chain-weight Loading: Application of—to the Determination of Jell Strength. Irving J. Saxl. *Physics*, Feb. 1936, P. 62–6.

Chain-weight loading is used for the application of weight upon a sample of standardized gelatine solution. It is possible in this manner to apply as well as reduce the weight gradually. This makes it possible to determine the jell strength, the yield point, and the recovery of jellies in a precise manner. It is suggested to adopt a term called *Jell Factor* (A), indicated by $A = \frac{1}{2} \cdot$Breaking Load$\cdot$Penetration (gram centimeters), for the evaluation of jellying characteristics of gelatines. (X)

Cotton Fibre: Anatomy of the. Karl Küsebauch. *Mell. Textilber.*, 1936, P. 18.

Dr. W. Sieber has found that staining with Victoria Blue is an excellent method of distinguishing between raw and bleached cotton; raw cotton assumes a deep shade, when subjected to the test, but bleached cotton is only stained a pale blue. It has been found that Victoria Blue B colors the cuticles or their incrusting substances, as well as the remains of the contents of the lumen of the cotton fibre, while the cellulose constituent of the fibre is not colored. By means of this reaction it is also possible to distinguish between the various types of cotton. If an additional color test is made with Benzopurpurine 10B, which stains the contents of the lumen of the fibre differently from the cuticles, it is possible to distinguish between the cuticles and the lumen. The cuticles show considerable differences in their development according to the country of origin of the cotton. A colored plate and numerous photomicrographs serve to illustrate the discussion of the color reactions of characteristic types of cotton. (From *Rayon & Mell.*, April 1936, P. 96.) (C)

Cotton: Moisture Relations. A. Bradley. *Trans. Faraday Soc.*, 1935, V. 31, P. 1652–5; *J. T. I.*, Mar. 1936, P. A127. (C)

Evenometer: New Instrument for Measuring the Degree of Unevenness of Silk. *Rayon & Mell.*, April 1936, P. 39; *Am. Silk & Rayon J.*, May 1936, P. 30–2.

Developed by the United States Testing Co., Hoboken, N. J., the "Evenometer" scans, with eyes of a photo-electric cell, silk in 9-meter

lengths on each of a series of seriplane boards, and autographically charts (1) the true average diameter size of the yarn, (2) the standard deviation, and (3) the mean squared deviation or variance, all expressed in microns. (C)

FIBRE SURFACE STUDIES. CAN EVEN THE SLIGHTEST DAMAGES IN WOOL FIBRES BE MADE VISIBLE? H. Reumuth and H. Schwerdtner. *Z. ges. Textil-Ind.*, 1936, V. 39, P. 12–18.

Microscopic methods of examn. of fibre are described and an improved method is developed. Photomicrographs show the results obtained by this method on a variety of wool fibres. (From *C. A.*, 1936, V. 30, Col. 1567.) (W)

FIBRES: CROSS-SECTIONAL SHAPE; DEFINITION. W. Garner. *J. Soc. Dyers Col.*, 1935, V. 51, P. 414–5.

Various methods affording a numerical description of the cross-section of fibres are briefly reviewed. The conclusion is reached that two coefficients should be considered, when relating the properties of a fibre to its cross-section, namely, the "circularity," $c = 127.3a/L^2$, where a is the area of cross-section in μ^2 and L is the length of long axis of cross-section, and either the ratio of the actual periphery to the minimum possible periphery, or the ratio of the peripheral surface to the unit mass. (From *J. T. I.*, Mar. 1936, P. A128.) (C)

FILAMENTS AND YARNS: COUNT MEASUREMENT. P. A. Koch. *Arch. tech. Mess.*, 1934, V. 4, P. T93.

A concise statement for general technical readers. Correction factors for obtaining the true area of cross-section of rayon filaments from the area of microscopic sections have been provided by A. Herzog, as follows: From microtome sections, all rayons other than acetate, 0.93. From sections cut by Viviani's cork method, acetate 1.06, cuprammonium and viscose 0.90, and nitro-rayon 0.89. (From *J. T. I.*, Feb. 1936, P. A76.) (C)

FLUORESCENCE MICROSCOPY. J. Grant. *Tex. Mfr.*, May 1936, P. 193.

Fluorescence testing of textiles can be applied microscopically. The scope of the method and the general arrangements are outlined. (C)

HAIR FIBRES IN WOOL. N. A. Bowman. *J. Dept. Agric.*, Vict., 1933, V. 31, P. 354 (through *Animal Breeding Abs.*, 1935, V. 3, P. 379).

If a clean sample is placed in a developing tray into which some benzol is poured, and covered with a plate glass, the wool will be invisible, while hair fibres will show up as white strands. (From *J. T. I.*, Feb. 1936, P. A76.) (C)

HILGER TRICHROMATIC COLORIMETER. *Tex. Mfr.*, April 1936, P. 155.

A new form of colorimeter, convenient in operation, and of comparatively low cost, for the measurement and permanent numerical specification of colors of dyes and fabrics, etc. Mfg. by Adam Hilger Ltd., 98 Kings Road, London. (C)

POROSITY: DETERMINATION OF THE DEGREE OF THE—OF (TEXTILE) GOODS. J. Geissler. *Spinner u. Weber*, 1935, V. 53, No. 50, P. 1.

The degree of porosity is a measure of the amt. of air enclosed within the fibres of a fabric and can be detd. from measurements of the wt., thickness and sp. gr. The method as applied to various fabrics is described. (From *C. A.*, 1936, V. 30, Col. 869.) (W)

PYROXYLIN AND RUBBER COATED FABRIC: TESTING. D. McBurney. *Ind. Eng. Chem.*, 1935, V. 27, P. 1400–3; *J. T. I.*, Mar. 1936, P. A133. (C)

RADIOGRAPHY OF CLOTH. H. F. Sherwood. *Rayon & Mell.*, May 1936, P. 51–3.

Describes instrument, using long wave-length X-rays, known as soft X-rays or "Grenz" rays, by which radiographs of textile or other specimens are produced on fine-grain films or plates. The processed film may be examined by a lens, or photographic enlargements may be made to allow visual inspection. Metallic weighting of cloth, and defects due to overstretching of the yarn are plainly disclosed. Thick cloths and highly twisted yarns absorb these X-rays more strongly than thin cloths and loosely twisted yarns. (C)

Book Reviews

PROCEEDINGS OF THE SECOND DEARBORN CONFERENCE OF AGRICULTURE, INDUSTRY AND SCIENCE. Farm Chemurgic Council, Dearborn, Mich. Pp. 410, illustrated. Price 50c.

Reports the three-day conference, held at Dearborn, May, 1936, under sponsorship of the Farm Chemurgic Council and the Chemical Foundation, Inc., the stated purpose of which is "to advance the industrial use of American farm products through applied science." Among the conference papers of especial interest to the textile industry are the following: Cotton Roads, Howard E. Coffin; Whole Cotton as a Source of Oil and Alpha-cellulose, Dr. F. K. Cameron; Rayon and Cellophane, Dr. G. P. Hoff; The Chemistry of Cellulose, Dr. Wanda K. Farr. (C)

WHY QUIT OUR OWN. George N. Peek and Samuel Crowther. D. Van Nostrand Co., Inc., New York, N. Y. Pp. 353.

A critical analysis of administration policies relating to agriculture and foreign trade by the former administrator of the A. A. A., and his constructive suggestions "toward achieving the desired balance in our economy." The following are some of the chapter headings: Broken Promises; The Pledges of 1932; The Plow-up and Kill; Founding an Un-American Foreign Policy; The Sell-out; Internationalism Gone Wild. About one-half of the book appeared in six articles in the *Saturday Evening Post* under the title "In and Out." (C)